International Journal of Advance Research in Science and Engineering
Volume No.07, Special Issue No.02, April 2018
www.ijarse.com
IJARSE
ISSN: 2319-8354

# STUDY ON GREEN CONCRETE – A REVIEW

**Er Shiv Shakti[1], Gaurav Chaudhary[2], Akshat Saxena[3]**

*[1]Assistant Professor, Civil Engineering Dept,*
*Gurukul Institute Of Engineering Technology, Kota (India)*
*[2,3]B.Tech II Year, Civil Engineering Dept,*
*Gurukul Institute Of Engineering Technology, Kota (India)*

**ABSTRACT**

*Conventional concrete is responsible for amount of carbon-dioxide emission to some Extent. So to reduce the emission, various types of concrete are developed using waste products from industries and agricultural use like blast furnace slag, silica fume, fly ash which requires low Amount of energy and also cause least harm to the environment. Green concrete is a new technology developed now days to reduce the effect on environment by production of cement. Cement contains high amount of carbon-dioxide which harms the environment drastically, so by replacing the cement by various materials which causes harm to the environment we not only reduce the problem of disposal of these materials but also we reduce the emission of carbon-dioxide from cement and as a result of which we reduces the negative effect on environment.*

***Keywords – Blast furnace slab,*** **$Co_2$** ***Emission, Eco-Friendly concrete, Fly ash, Green Concrete, Silica fume.***

## I. INTRODUCTION

The word "Green- Concrete" does not refer to the color of the concrete rather it indicates its environmental - sustainability and eco-friendliness .In general green-concrete is the concrete which reduces carbon dioxide emission, saves energy and majorly consist of non-biodegradable wastes of industries such as fly-ash, rice husk-ash, GGBS(slag) and ferrochrome ash etc. Firstly as it replaces ordinary Portland cement (partially or fully) ultimately carbon dioxide emission is reduced. Secondly most of the industrial wastes are in pulverized form hence energy consumed for production is saved. Thirdly as it utilizes non biodegradable industrial waste, the dumping issues will be solved hence soil and water pollution will be drastically reduced. Under green concrete various type concretes are included such as:-fly-ash based concrete, rice-husk ash based concrete, slag based concrete and geopolymer concrete. so it is a concept of thinking and environment into an every aspect of the raw materials manufacture over construction, mixture design to structural design, and durability. Green concrete is very often considered to be cheap to produce due to the use of recycled material whereby avoiding the charges for the disposal of waste, less energy consumption and greater durability.

While a normal construction practices are guided by short term economic considerations, sustainable construction is focused on best practices which emphasize on long term affordability, durability and effectiveness. At each stage of the life cycle of the construction, it increases ease and quality of life, while minimizing the negative environmental impacts and increasing economic sustainability of the construction. Any

infrastructure designed and constructed in a sustainable way minimizes the use of resources through the whole life cycle of the construction process in which the green concrete play a vital role in achieving the sustainable construction. Having so much of advantageous has led to popularity in construction world and one of the emerging technology in sustainable construction. Green concrete is miracle of present and tool for future when the natural resources are on the verge of extinction.

Due to growing interest in sustainable development, engineers and architects are motivated more than ever before to choose materials that are more sustainable. Selection of material for concrete is more sustainable and minimizes environmental impact. Cement production accounts for more than 6% of all $Co_2$ emission which is a major factor in the world's global warming (Greenhouse gas). India is the third largest cement producer in the World and one of the largest consumers of cement per capita in the world. Rough figures are that India consumes about 1.2 Ton/year/capita, while as World average is 0.6 Ton/year/capita. $Co_2$ emissions from 1 ton of concrete produced vary between 0.05 to 0.13 tons. 95% of all $Co_2$ emissions from a cubic meter of concrete are from cement manufacturing.

Cement is the one of the major component of the concrete. The production of one ton of cement releases one ton of a $Co_2$ into the atmosphere. $Co_2$ is known to be greenhouse gas that contributes to the global warming. The reduction in $Co_2$ emission from a concrete can be achieved with a partial/full replacement of cement by the various supplementary cementitious materials like silica fume. The use of these cementitious materials has resulted in an improvement of the properties of concrete.

So to reduce this environmental impact green concrete plays a vital role. By using recycled materials or waste materials (which are harmful to the environment) as a replacement of cement such as fly ash, silica flume, etc. we can reduce the CO2 emission from concrete as well as it reduces the environmental impact on earth. As a result of which green concrete is one of the major tool in the future when the natural resources are on verge of extinction.

## II. OBJECTIVES

1) To study the effect of silica fume on the environment.

2) To study the effectiveness of concrete by partial replacement of cement by silica fume.

3) To determine the strength of new mix design concrete of grade M40.

4) To determine the various test results like compression test, flexural test & split tensile test.

5) To find the optimum percentage of silica fume in cement so that we can achieve maximum strength by increasing percentage as 5%,10%,15%,20%.

## III. LITERATURE REVIEW

**In 2018, Sanjay Thakur, et al** studies fly ash concrete and the research study of silica fume concrete conclude that: 1.The use of both silica fume and fine aggregate will be overall beneficial 2. By the use of these there will be decrease in amount of cement and fine aggregate 3.The initial property of concrete like bleeding, segregation and slump will improve 4.There will be increase in the strength of concrete that is high strength performance

concrete is formed. 5. The use of both fly ash and silica fume in concrete will overall enhance all the property of concrete and high strength concrete is achieved with the partial replacement of silica fume and fly ash.

**In 2016, Praveer Singh, et al** studied about the silica fume and comes to the conclusion that cement is becoming a scarce resource all over the world because of increase in demand day by day. The use of silica fume as a pozzolana material has increased in recent years because when mixed in certain proportions it enhances the properties of both fresh and hard concrete. Addition of silica fume in proper proportion improves durability attack by acidic waters and improving concrete conditions.

**In 2015, Arun Borsaikia, et al** studied about the silica fume & its properties and comes to the conclusion that various parameters of both fresh and hardened concrete are getting changed due to silica fume content. Following conclusions can be made. 1. Workability of concrete improves with addition of silica fume up to certain limit. 2. Ultimate compressive strength of concrete increases with replacement of cement by silica at certain specified limit. 3. Ultrasonic Pulse Velocity increases with increase in compressive load initially and the decreases with increase in compressive load due development of micro cracks in concrete. Abrupt decrease in Ultrasonic Pulse Velocity occurs at 70-80% of failure load.

**In 2014, Vishal S. Ghutke, et al** studied about the silica fume and comes to the conclusion that the silica fume is a better replacement of cement. The rate of strength gain in silica fume concrete is high. After performing all the tests and analyzing their result, the following conclusions can be derived: 1. With the increase in w/c ratio strength of concrete decreases. 2. The optimum value of compressive strength can be achieved in 10% replacement of silica fume. 3. As strength of 15% replacement of cement by silica fume is more than normal concrete. The optimum silica fume replacement percentage is varies from 10 % to 15 % replacement level. 4. Workability of concrete decreases as increase with % of silica fume. 5. Compressive strength decreases when the cement replacement is above 15% of silica fume.

**In 2014, Umesh Sharma, et al** studied about the silica fume & concluded that concrete is the most important engineering material in a construction industry because of its inherent strength properties. Micro silica primarily of very fine smooth spherical silicon reason of Air Pollution. This is a by-product of some Industries. Use of micro-silica with concrete decreases the air pollution. Silica fume also decrease the voids in concrete. oxide particles with an extremely high surface area. Micro silica particle are 100 times smaller than as that of cement particle. Silica fume is usually categorized as a supplementary cementitious material. These material exhibit pozzolanic properties, cementitious properties and a combination of both properties due to this properties it can affect the concrete behaviour in many ways. Silica fume is a material which may be a a reason of Air Pollution. This is a by-product of some Industries. Use of micro-silica with concrete decreases the air pollution. Silica fume also decrease the voids in concrete.

**In 2013, Debabrata Pradhan, et al** studied about the silica fume and comes to the conclusion that the optimum compressive strength is obtained at 20% cement replacement by silica fume at all age levels (i.e. at 24 hours, 7 and 28 days). Slump value may be increased by increasing the dosages of superplasticizer without hampering the strength for further investigation but the ranges of compacting factor from 0.82 to 0.88 and slump value from 20 to 50mm are also good for using concrete in the field in control system. Higher compressive strength resembles that the concrete incorporated with silica fume is high strength concrete (HSC) as per IS code

recommendations. It is reported that improved pore structures at transition zone of silica fume concrete led to it as high performance concrete but durability tests are yet to be surveyed. During the testing of cubes at 28 days the failure plane of cubes cut the aggregates but not along the inter facial zone which is concluded that the interfacial zone attained much higher strength than control concrete i.e. concrete without silica fume.

**In 2012, N. K. Amudhavalli, et al** concluded that Portland cement is the most important ingradient of concrete and is a varsetile and relatively high cost material. Large scale production of cement is causing enviornmental problems on one hand and depletion of natural resources on other hand. This threat to ecology has led to researchers to use industrial by products as supplementary cementatious material in making concrete. This paper represents the detail experimental study on compressive strength, flexural strength and split tensile strength. Consistency of cement depends upon its fineness. Silica fume is having greater fineness than cement and greater surface area so the consistency increases greatly, when silica fume percentage increases.

**In 2012, Ajay Verma, et al** concluded in there paper that concrete is the most important engineering material and the addition of some other materials may change the properties of concrete. With increase in a trend towards the wider use of concrete for high rise buildings there is a growing demand of concrete with higher compressive strength. There are two types of materials crystalline and noncrystalline. Micro silica or silica fume is very fine non crystalline material. Silica fume is produced in electric arc furnace as a by-product of the production of elemental silicones or alloys, containing the silicon. Silica fume was initially viewed as cement replacement material and in some area it is usually used as replace by much smaller quantity of silica fume may be used as pozzolanic admixtures. Silica fume increases the strength of concrete more 25%. Silica fume is much cheaper than cement therefore it very important from economical point of view.

## IV. CONCLUSION

Silica fume is a material which may cause air pollution; this is the byproduct of some industries. Addition of micro silica in cement reduces the air pollution and makes concrete more sustainable; as well as the optimum replacement of cement with silica 5% to 15% leads to increase in strength whereas the 20% replacement leads to decrease in strength of concrete.

Silica fume is finer than cement and more reactive to concrete ingredients so it increases the normal consistency of cement and achieves more strength in less time as compare to conventional concrete.

By replacing the fine aggregate with demolished brick waste, there is no significant effect on any strength of concrete, but the overall cost of concrete reduces up to 20% so economically the concrete is more economical than conventional concrete.

## V. ACKNOWLEDGEMENT

I would like to express my profound gratitude and indebtedness to Er. Pooja Nama who have always been a constant motivation and guiding factor throughout this works in Civil Engineering Department as HOD, Gurukul Institute Of Engineering. It has been a great pleasure for me to get an opportunity to work with him and complete the work successfully.

**REFERANCES**

1. Sanjay Thakur & Harpreet Singh2018 "A Review on Effect of Silica fume and Fly Ash on Concrete by Some Partial Replacement of Cement and fine aggregate", International Research Journal of Engineering and Technology (IRJET).

2. Praveer Singh, Mohd. Afaque Khan & Abhishek Kumar 2016 "The Effect on Concrete by Partial Replacement of Cement by Silica Fume", International Research Journal of Engineering and Technology.

3. Arun Borsaikia 2015 "Effect of silica fume on some properties of concrete", Research gate.

4. Vishal S. Ghutke & Pranita S.Bhandari 2014 "Influence of silica fume on concrete", *IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE).*

5. Umesh Sharma, Ankita Khatrib & Abhishek Kanoungoc 2014 "Use of Micro-silica as Additive to Concrete-state of Art", International Journal of Civil Engineering Research.

*6. Debabrata Pradhan &* D. Dutta2013 "Effects of Silica Fume in Conventional Concrete", International *Journal of Engineering Research and Applications* (IJERA).

7. N.K.Amudhavalli & Jeena Mathew, 2012 "Effect Of Silica Fume On A Strength & Durability Parameters Of Concrete", International Journal of Engineering Sciences & Emerging Technologies.

8. Ajay Verma, Chandak Rajeev & Yadav R.K. 2012 "Effect of Micro Silica on The Strength of Concrete with Ordinary Portland Cement", Research Journal of Engineering Sciences.

9. Concrete Technology : M.S. Shetty ( S. Chand Publications ).

10. Concrete Technology: A.M. Neville, J.J. Brooks ( Pearson Publications ).

11. www.quora.com.